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1CAN110301

November 19, 2003

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

SUBJECT: Response to NRC Bulletin 2003-02 Regarding Reactor Vessel Lower Head  
Nozzle Integrity  
Arkansas Nuclear One, Unit 1  
Docket No. 50-313  
License No. DPR-51

REFERENCES:

- 1 NRC letter dated August 21, 2003, NRC Bulletin 2003-02: *Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity* (0CNA080305)
- 2 Entergy letter dated May 14, 2002, *60-Day Response to NRC Bulletin 2002-01, Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity* (0CAN050201)
- 3 Entergy letter dated November 21, 2002, *Response to NRC Request for Additional Information Regarding NRC Bulletin 2002-01 for ANO-1 Incore Instrument Nozzles* (1CAN110203)

Dear Sir or Madam:

On August 21, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin 2003-02, *Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity*. The NRC requested that all Pressurized Water Reactor addressees having reactor vessel bottom mounted instrument nozzles provide information related to inspection of these nozzles at their forthcoming and subsequent refueling outages.

The Arkansas Nuclear One, Unit One (ANO-1) outage occurs in the spring of 2004; therefore, Entergy is providing a 90-day response as set forth by the bulletin. The ANO-1 response is provided in Attachment 1 to this submittal.

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The response to NRC Bulletin 2003-02 includes new commitments as summarized in Attachment 2.

If you have any questions or require additional information, please contact Steve Bennett at 479-858-4626.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 19, 2003.

Sincerely,



Sherrie R. Cotton  
Director, Nuclear Safety Assurance

SRC/sab

Attachments:

1. Response to NRC Bulletin 2003-02, Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity
2. List of Regulatory Commitments

cc: Dr. Bruce S. Mallet  
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U. S. Nuclear Regulatory Commission  
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**Attachment 1**

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**Response to NRC Bulletin 2003-02,  
Leakage from Reactor Pressure Vessel Lower Head Penetrations and  
Reactor Coolant Pressure Boundary Integrity**

**Arkansas Nuclear One - Unit One  
Response to NRC Bulletin 2003-02,  
Leakage from Reactor Pressure Vessel Lower Head Penetrations and  
Reactor Coolant Pressure Boundary Integrity**

On August 21, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin 2003-02, *Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity*. The 90-day response to the bulletin for Arkansas Nuclear One, Unit One (ANO-1) is provided below.

**NRC Request 1(a):** *A description of the RPV lower head penetration inspection that has been implemented at your plant. The description should include when the inspections were performed, the extent of the inspections with respect to the areas and penetrations inspected, inspection methods used, the process used to resolve the source of findings of any boric acid deposits, the quality of the documentation of the inspections (e.g., written report video record, photographs), and the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations.*

**Entergy Response to Request 1(a):**

As identified in the response to Bulletin 2002-01 (Ref. 2), and as supplemented in Entergy's response to the NRC request for additional information on November 21, 2002 (Ref. 3), Entergy has established procedural controls to conduct Reactor Coolant System (RCS) walkdowns to identify potential leaks, perform boric acid evaluations, and restore systems, structures and components (SSCs) which have been affected by boric acid. In addition, the bottom mounted instrument (BMI) penetrations at ANO-1 are inspected as part of the ASME Section XI walkdowns performed every refueling outage with the system at normal operating pressure and the insulation in-place. These walkdown inspections are performed by procedure and documented on a system pressure test report in accordance with our ASME Section XI program. The system pressure tests have not identified any BMI leakage to date.

Due to industry concerns of potential BMI nozzle leakage in the fall of 2002, Entergy performed enhanced (videotaped) inspections of the ANO-1 incore instrument (ICI) nozzles to identify potential leakage during the fall 2002 refueling outage (1R17). Traces of boric acid were observed on four nozzles which were determined not to be RCS leakage. A summary of the additional BMI nozzle inspection performed on ANO-1 is provided in Entergy letter dated November 21, 2002 (Ref. 3). A general discussion of the boric acid traces and the conclusions reached are as follows:

The bottom head of the ANO-1 reactor vessel contains 52 ICI nozzles. These nozzles, as well as the nozzle J-welds on the inside diameter of the reactor vessel, are constructed of Alloy 600 material. During the ANO-1 under-vessel inspections conducted during October 2002, traces of boric acid were observed on the reactor cavity walls, floor, insulation, ICI nozzles and vessel supports. A light residue, suspected to be boron, was observed on four of the 52 BMI nozzles below the insulation panels on ICI nozzles 1, 7, 15, and 30. The annuli around these four nozzles and the bottom of the reactor vessel (RV) were inspected with a boroscope. In general, the vessel itself was noted to be relatively clean and in good condition, with uniform, brown discoloration of the silver-colored, high-temperature coating. No "popcorn" type boric acid deposits or other boric acid accumulations were observed at or near the nozzles inspected. The boric acid noted during the inspection was generally faint, white staining of the nozzle piping.

During the boroscope inspection of nozzles 7 and 15, the top of the insulation panels were also inspected. The panels were observed to be clean with no boric acid present. The angle iron support structure for the insulation was very clean, with some small widely spaced surface corrosion noted. As discussed in Reference 3, the four nozzles inspected with a boroscope had no evidence of leakage from the nozzle annulus. Seal plate leakage during historical refueling outages was a fairly common problem prior to installation of the permanent seal plate in 1993. The boric acid identified was attributed to this event.

**NRC Request 1(b):** *A description of the RPV lower head penetration inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the extent of the inspections which will be conducted with respect to the areas and penetrations to be inspected, inspection methods to be used, qualification standards for the inspection methods, the process used to resolve the source of findings of boric acids deposits or corrosion, the inspection documentation to be generated, and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.*

**Entergy Response to Request 1(b):**

Extent of the Inspections: The examination scope for ANO-1 refueling outage 1R18 (Spring 2004) will include the 52 ICI penetrations with the intent to inspect 100% of the circumference of each penetration as it enters the RPV lower head. This bare metal visual examination is a new examination in this high dose area, and will be performed to the maximum extent practical. The scope and approach for future ICI nozzle inspections will consider lessons learned from the 1R18 inspection and other BMI inspections conducted within the industry.

Inspection Methods: The examination methods for the BMI penetrations at ANO-1 are planned to be a combination of direct visual (VT-2), remote crawler video and/or boroscopic probes. In the interest of maintaining doses low, a robotic "crawler" with video capability is planned to be used to the extent possible to perform and record the inspection. Insulation will be removed to the extent necessary to provide access to the bare metal around each BMI penetration that cannot be accessed for inspection with the crawler.

Qualification Standards: At least one of the visual examination personnel will be qualified in accordance with ASME Section XI VT-2 visual examination requirements and will perform examinations using ANO Procedure 2311.009, *ANO Unit One and Unit Two Alloy 600 Inspection*.

Process Used to Resolve the Source of the Findings: As discussed in Reference 2, ANO Procedure 1032.037, *Inspection and Evaluation of Boric Acid Leaks*, governs the ANO process for investigating and evaluating boric acid leaks. The program responsibilities include performing preliminary investigations of the cause and severity of the leak, coordinating resolution of the condition and determining the root cause of the leak. Problem identification and resolution dealing with potential leakage associated with the BMI nozzle inspections will be documented in the Entergy Corrective Action Program. The process will include evaluations to determine if the findings could be indicative of leakage as well as to determine the source of the boric acid.

Documentation of the Inspections: The inspections will be documented in ANO Procedure 2311.009. If there is an accumulation of boron, an evaluation of the cause will be prepared as part of the Entergy Corrective Action Program.

Basis for Concluding that Your Plant Will Satisfy Applicable Regulatory Requirements: The system walkdowns, as discussed in the response to NRC Request 1(a), are performed in accordance with Section XI of the ASME Code. There is currently no NRC or ASME Code requirements to perform a bare metal visual inspection of the bottom mounted instrument nozzles on the reactor vessel. However, based on the commitment made in response to this bulletin, Entergy is going beyond the regulatory requirements to ensure the integrity of the RCS.

**NRC Request 1(c):** *If you are unable to perform a bare-metal visual inspection of each penetration during the next refueling outage because of the inability to perform the necessary planning, engineering, procurement of materials, and implementation, are you planning to perform bare-metal visual inspections during subsequent refueling outages? If so, provide a description of the actions that are planned to enable a bare-metal visual inspection of each penetration during subsequent refueling outages. Also, provide a description of any penetration inspections you plan to perform during the next refueling outage. The description should address the applicable items in paragraph (b).*

**Entergy Response to NRC Request 1(c):**

As stated in the response to 1(b) above, Entergy is planning to remove insulation as necessary to accommodate a bare metal examination of the 52 BMI penetrations by direct visual, robotic crawler, and/or boroscopic inspection.

**NRC Request 1(d):** *If you do not plan to perform either a bare-metal visual inspection or non-visual (e.g., volumetric or surface) examination of the RPV lower head penetrations at the next or subsequent refueling outages, provide the basis for concluding that the inspections performed will assure applicable regulatory requirements are and will continue to be met.*

**Entergy Response to NRC Request 1(d):**

Entergy is planning a 100 % visual examination of the ICI nozzles at ANO-1 during refueling outage 1R18 as described above.

**NRC Request 2:** *Within 30 days of plant restart following the next inspection of the Reactor Pressure Vessel (RPV) lower head penetrations, the subject PWR addressees should submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the lower head, any findings of relevant indications of through-wall leakage, and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.*

**Entergy Response to NRC Request 2:**

In accordance with NRC Order EA-03-009, Section IV.E, Entergy will be providing a summary report of the findings of the RV head inspections within 60 days after restart from the 1R18

refueling outage. Entergy proposes this report submittal timing for response to this bulletin to reduce the number of reports to be submitted for Alloy 600 inspections. If a BMI nozzle is found to be leaking, notification will be made in accordance with 10CFR50.72. Therefore, within 60 days of plant restart following the next inspection of the RPV lower head penetrations, Entergy will submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the lower head, any findings of relevant indications of through-wall leakage, and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.

**Attachment 2**

**1CAN110301**

**List of Regulatory Commitments**



### List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE- TIME ACTION	CONT COMP	
The examination scope for ANO-1 refueling outage 1R18 (Spring 2004) will include the 52 ICI penetrations with the intent to inspect 100% of the circumference of each penetration as it enters the RPV lower head. Insulation will be removed to the extent necessary to provide access to the bare metal around each BMI penetration that cannot be accessed for inspection with the crawler. The inspections will be documented in ANO Procedure 2311.009.	X		1R18 (Spring 2004)
The scope and approach for future ICI nozzle inspections [beyond 1R18] will consider lessons learned from the 1R18 inspection and other BMI inspections conducted within the industry.		X	Fall 2005
At least one of the visual examination personnel will be qualified in accordance with ASME Section XI VT-2 visual examination requirements and will perform examinations using ANO Procedure 2311.009, "ANO Unit One and Unit Two Alloy 600 Inspection."	X		1R18 (Spring 2004)
Problem identification and resolution dealing with potential leakage associated with the BMI nozzle inspections will be documented in the Entergy Corrective Action Program. The process will include evaluations to determine if the findings could be indicative of leakage as well as to determine the source of the boric acid.	X		1R18 (Spring 2004)
Entergy will submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the lower head, any findings of relevant indications of through-wall leakage, and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.	X		Within 60 days of plant restart following 1R18